Exercise - I (Conceptual Questions) Build Up Your Understanding

ELECTRIC CURRENT & DRIFT VELOCITY

1. If 10^6 electrons/s are flowing through an area of cross section of 10^{-4} m^2 then the current will be :–
(1) 1.6×10^{-7} A (2) 1.6×10^{-13} A
(3) 1×10^{-6} A (4) 1×10^{2} A

2. The current in a conductor varies with time t as $I = 2t + 3t^2$ A where I is amperes and t in seconds. Electric charge flowing through a section of the conductor during t = 2 s to t = 3 s is :-
(1) 10 C (2) 24 C
(3) 33 C (4) 44 C

3. 10,000 electrons are passing per minute through a tube of radius 1cm. The resulting current is :
(1) 10000 A (2) 0.25×10^{-16} A
(3) 10^{-9} A (4) 0.5×10^{-19} A

4. There are 8.4×10^{22} free electrons per cm^3 in copper. The current in the wire is 0.21 A ($e = 1.6 \times 10^{-19}$ C). Then the drifts velocity of electrons in a copper wire of 1 mm^2 cross section, will be :–
(1) 2.12×10^{-5} m/s (2) 0.78×10^{-5} m/s
(3) 1.56×10^{-5} m/s (4) none of these

5. There is a current of 40 amperes in a wire of 10^{-6} m^2 area of cross-section. If the number of free electrons per m^3 is 10^{29}, then the drift velocity will be
(1) 1.25×10^{3} m/s (2) 2.50×10^{-3} m/s
(3) 25.0×10^{-3} m/s (4) 250×10^{-3} m/s

6. S.I. unit of current is :-
(1) C (2) A (3) A/s (4) N/s

7. When no current flows through a conductor :-
(1) the free electrons do not move
(2) the average speed of a free electron over a large period of time is zero
(3) the average velocity of a free electron over a large period of time is zero
(4) the average of square of velocities of all the free electrons at an instant is zero

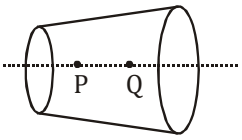
8. The number of free electrons per 10 mm of an ordinary copper wire is about 2×10^{21}. The average drift speed of the electrons is 0.25 mm/s The current flowing is :-
(1) 0.8 A (2) 8 A (3) 80 A (4) 5 A

9. In a Neon discharge tube 2.9×10^{18} Ne^+ ions move to the right each second, while 1.2×10^{18} electrons move to the left per second; electron charge is 1.6×10^{-19} C. The current in the discharge tube is :-
(1) 1 A towards right
(2) 0.66 A towards right
(3) 0.66 A towards left
(4) zero

10. Two wires each of radius of cross section r but of different materials are connected together end to end (in series). If the densities of charge carriers in the two wires are in the ratio 1:4, the drift velocity of electrons in the two wires will be in the ratio :
(1) 1 : 2 (2) 2 : 1 (3) 4 : 1 (4) 1 : 4

11. A current I flows through a uniform wire of diameter d when the electron drift velocity is v. The same current will flow through a wire of diameter d/2 made of the same material if the drift velocity of the electrons is
(1) v/4 (2) v/2 (3) 2v (4) 4v

12. A wire has a non–uniform cross–section as shown in figure. A steady current flows through it. The drift speed of electrons at points P and Q is v_P and v_Q, then :-



(1) $v_P = v_Q$
(2) $v_P < v_Q$
(3) $v_P > v_Q$
(4) data is insufficient

13. The plot represents the flow of current through a wire for different time intervals. The ratio of charges flowing through the wire corresponding to these time intervals is (see figure) :-

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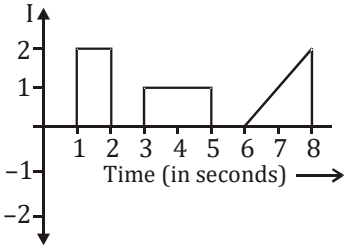


(1) 2 : 1 : 2 (2) 1 : 3 : 3
(3) 1 : 1 : 1 (4) 2 : 3 : 4

OHM'S LAW & ELECTRICAL RESISTANCE

14. Three copper wires are there with lengths and cross-sectional areas as (ℓ, A); $\left(2\ell, \frac{A}{2}\right)$ and $\left(\frac{\ell}{2}, 2A\right)$. Resistance :-
(1) minimum for the wire of cross-sectional are $\frac{A}{2}$
(2) minimum for the wire of cross-sectional are A
(3) minimum for the wire of cross-sectional area 2A
(4) same for all the three cases.

15. A wire of uniform cross-section A, length ℓ and resistance R is bent into a complete circle; the resistance between any two of diametrically opposite points will be :–
(1) $\frac{R}{2}$ (2) $\frac{R}{4}$ (3) $\frac{R}{8}$ (4) 4R

16. The electric resistance of a certain wire of iron is R. If its length and radius both are doubled,
then :–
(1) the resistance will be halved and the specific resistance will remain unchanged
(2) the resistance will be halved and the specific resistance will be doubled
(3) the resistance and the specific resistance, will both remain unchanged
(4) the resistance will be doubled and the specific resistance will be halved.

17. When a piece of aluminium wire of finite length is drawn to reduce its diameter to half its original value, its resistance will become :-
(1) two times (2) four times
(3) eight times (4) sixteen times

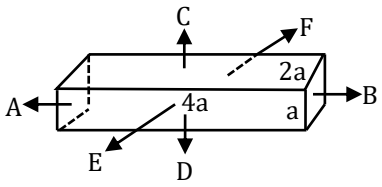
18. As the temperature of a metallic resistor is increased, the product of resistivity and conductivity :-
(1) increases
(2) decreases
(3) may increase or decrease
(4) remains constant.

19. If a wire is stretched, so that its length is 20% more than its initial length, the percentage increase in the resistance of the wire is :-
(1) 40% (2) 10%
(3) 44% (4) 25%

20. The length of a given cylindrical wire is increased by 100%. Due to the consequent decrease in diameter the change in the resistance of the wire will be :–
(1) 300% (2) 200%
(3) 100% (4) 50%

21. On increasing the temperature, the specific resistance of a conductor and a semiconductor-
(1) both increase
(2) both decrease
(3) increases and decreases respectively
(4) decreases and increases respectively

22. A conductor with rectangular cross section has dimensions (a × 2a × 4a) as shown in figure. Resistance across AB is x, across CD is y and across EF is z. Then



(1) x = y = z (2) x > y > z
(3) y > x > z (4) x > z > y

23. Specific resistance of a conductor increases with:–
(1) increase in temperature.
(2) increase in cross–sectional area
(3) increase in cross–sectional area and decrease in length.
(4) decrease in cross–sectional area.

24. The temperature coefficient of resistance of a wire is 0.00125 per degree celcius. At 300 K its resistance is 1 ohm. The resistance of the wire will be 2 ohms at a temperature :–
(1) 1154 K (2) 1127 K
(3) 600 K (4) 1400 K

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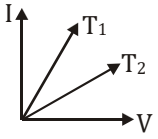
25. The current voltage graph for a given metallic conductor at two different temperatures T_1 and T_2 are as shown in the figure. Then :–



(1) $T_1 > T_2$
(2) $T_1 = T_2$
(3) nothing can be said about T_1 and T_2
(4) $T_1 < T_2$

26. The effective resistance is $\frac{6}{5}\ \Omega$, when two wires are joined in parallel. When one of the wire breaks, the effective resistance is 2 ohms. The resistance of the broken wire was :–

(1) $\frac{3}{5}\ \Omega$ (2) $2\ \Omega$ (3) $\frac{6}{5}\ \Omega$ (4) $3\ \Omega$

27. At what temperature will the resistance of a copper wire become three times its value at 0° C? [Temperature coefficient of resistance for copper = 4×10^{-3} per °C] :–

(1) 400° C (2) 450° C
(3) 500° C (4) 600° C

28. Copper and silicon are cooled from 300 K to 60 K; the specific resistance :–

(1) decreases in copper but increases in silicon
(2) increases in copper but decreases in silicon
(3) increases in both
(4) decreases in both

29. Two resistances R_1 and R_2 are made of different materials. The temperature coefficient of the material of R_1 is α and that of the material of R_2 is $-\beta$. The resistance of the series combination of R_1 and R_2 does not change with temperature, then the ratio of resistances of the two wires at 0°C will be :

(1) $\frac{\alpha}{\beta}$ (2) $\frac{\alpha+\beta}{\alpha-\beta}$
(3) $\frac{\alpha^2+\beta^2}{\alpha\beta}$ (4) $\frac{\beta}{\alpha}$

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COMBINATION OF RESISTANCES & KIRCHHOFF'S LAW

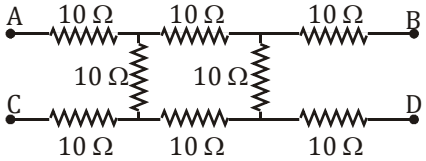
30. A metal wire of resistance R is cut into three equal pieces which are then connected side by side to form a new wire, the length of which is equal to one third of the original length. The resistance of this new wire is :-

(1) R (2) 3R
(3) $\frac{R}{9}$ (4) $\frac{R}{3}$

31. Three resistances of values 2 Ω, 3 Ω and 6 Ω are to be connected to yield an effective resistance of 4 Ω. This can be done by connecting :

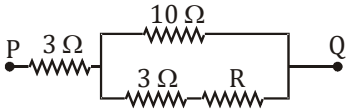
(1) 3 Ω resistance in series with a parallel combination of 2 Ω and 6 Ω
(2) 6 Ω resistance in series with a parallel combination of 2 Ω and 3 Ω
(3) 2 Ω resistance in series with a parallel combination of 3 Ω and 6 Ω
(4) 2 Ω resistance in parallel with a parallel combination of 3 Ω and 6 Ω

32. What will be the equivalent resistance between the points A and D?



(1) 10 Ω (2) 20 Ω
(3) 30 Ω (4) 40 Ω

33. In the circuit shown here, what is the value of the unknown resistance R so that the total resistance of the circuit between points 'P' and 'Q' is also equal to R :–



(1) 3 Ω (2) $\sqrt{39}\ \Omega$
(3) $\sqrt{69}\ \Omega$ (4) 10 Ω

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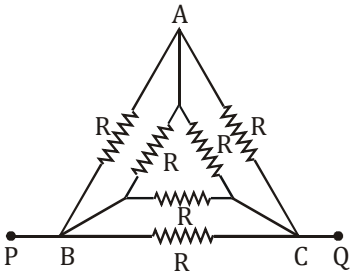
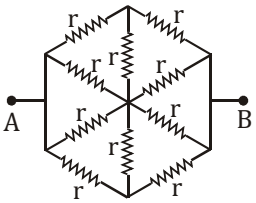
34. The resistance across P and Q in the given figure is



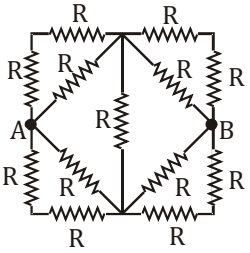
(1) $\frac{R}{3}$ (2) $\frac{R}{2}$ (3) 2R (4) 6R

35. The resistance of the circuit between A and B is :



(1) r (2) 0.5r (3) 2r (4) 3r

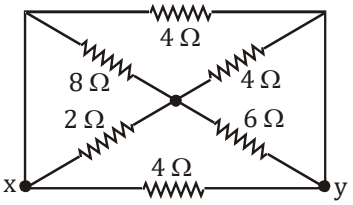
36. Thirteen resistances each of resistance R Ω are connected in the circuit as shown in the figure. The effective resistance between A and B is :-



(1) $\frac{4R}{3}\Omega$ (2) 2RΩ

(3) R Ω (4) $\frac{2R}{3}\Omega$

37. The total resistance between x and y in ohms is:-



(1) 1 Ω (2) 4 Ω

(3) $\frac{4}{3}$ Ω (4) $\frac{2}{3}$ Ω

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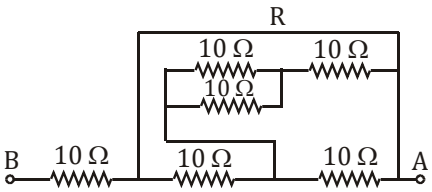
38. The resultant resistance of n wires each of resistance r ohms is R, when they are connected in parallel. When these n resistances are connected in series, the resultant resistance will be :-

(1) $\frac{R}{n}$ (2) $\frac{R}{n^2}$

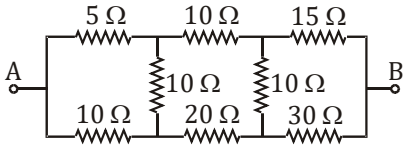
(3) nR (4) n^2R

39. For the network of resistance shown in the fig. the equivalent resistance of the network between the points A and B is 18 Ω. The value of unknown resistance R is :-



(1) 8 Ω (2) 10 Ω (3) 16 Ω (4) 24 Ω

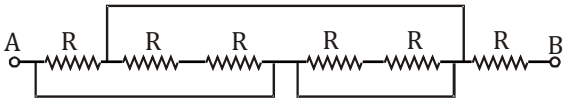
40. In the arrangement of resistances shown below, the effective resistance between points A and B is



(1) 20 Ω (2) 30 Ω

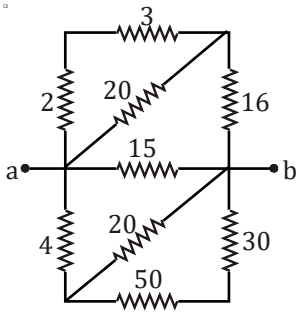
(3) 90 Ω (4) 110 Ω

41. In the circuit shown the equivalent resistance between A and B is



(1) R (2) 2R/5 (3) R/3 (4) 2R

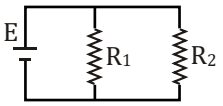
42. In the figure the numerical values denote resistances in SI units. The total resistance of the circuit between a & b will be:



(1) 12 ohms (2) 24 ohms.

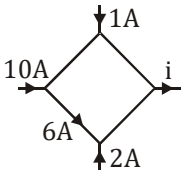
(3) 15 ohms (4) 6 ohms

43. Resistors R_1 and R_2 have an equivalent resistance of 6 ohms when connected in the circuit shown below. The resistance of R_1 could be (in Ω) :-



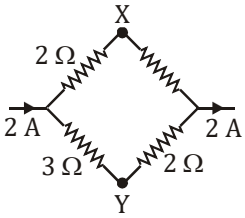
(1) 1 (2) 5 (3) 8 (4) 4

44. Value of current i in the following circuit is :-



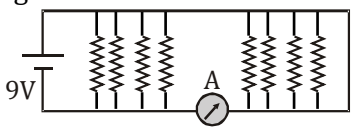
(1) 13 A (2) 12 A
(3) 9 A (4) none of the above

45. The potential difference between X and Y in volts is :-



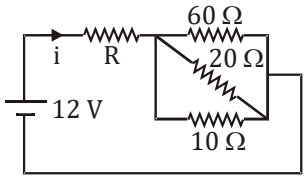
(1) 1 (2) –1 (3) 2 (4) –2

46. If each resistance in the fig. is of 9 Ω then reading of the ammeter is :–



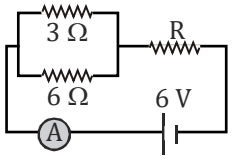
(1) 5 A (2) 8 A (3) 2 A (4) 9 A

47. If i = 0.25 A in figure, then value of R is :–



(1) 48 Ω (2) 12 Ω (3) 120 Ω (4) 42 Ω

48. If the ammeter in the given circuit reads 2 A, the resistance R is :–



(1) 1 ohms (2) 2 ohms
(3) 3 ohms (4) 4 ohms

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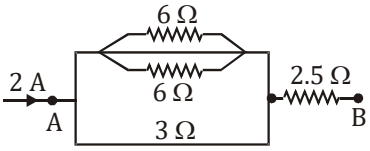
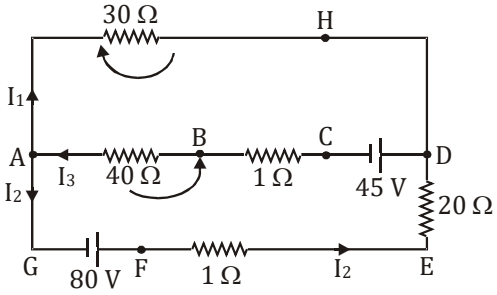
49. The equivalent resistance and potential difference between A and B for the circuit are respectively :–



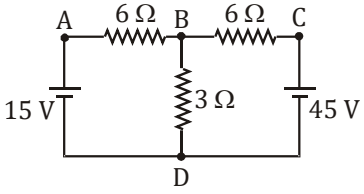
(1) 4 Ω, 8 V (2) 8 Ω, 4 V
(3) 2 Ω, 2 V (4) 16 Ω, 8 V

50. For the current loops shown in the figure, Kirchhoff's loop rule for the loops AHDCBA and AHDEFGA yields these equations respectively :-



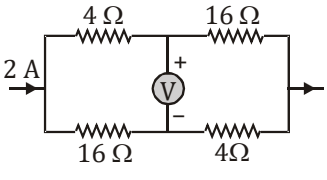
(1) $-30\ I_1 - 41\ I_3 + 45 = 0$ and $-30\ I_1 + 21\ I_2 - 80 = 0$
(2) $30\ I_1 - 41\ I_3 + 45 = 0$ and $30\ I_1 - 21\ I_2 - 80 = 0$
(3) $30\ I_1 + 41\ I_3 - 45 = 0$ and $-30\ I_1 + 21\ I_2 + 80 = 0$
(4) $-30\ I_1 - 41\ I_3 - 45 = 0$ and $-30\ I_1 + 21\ I_2 - 80 = 0$

51. In the circuit shown in figure, find the current through the branch BD.



(1) 1 A (2) 5 A
(3) 3 A (4) 7 A

52. In the circuit shown below, the reading of the voltmeter V is :-



(1) 12 V (2) 8 V (3) 20 V (4) 16 V

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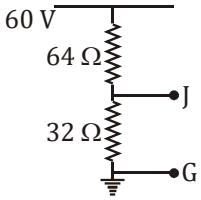
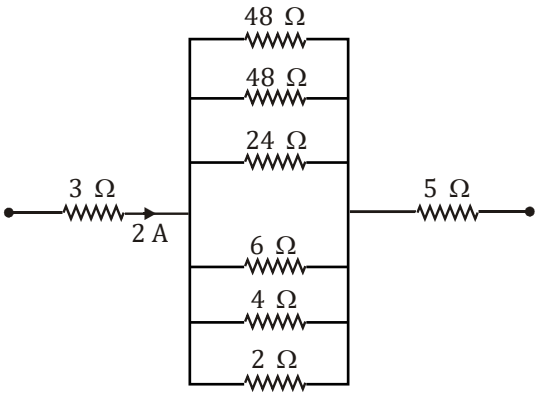
53. Find the potential of J with respect of G :-



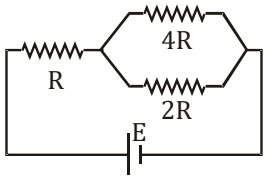
(1) 40 V (2) 60 V (3) 20 V (4) 30 V

54. Find the potential difference across the 24 Ω :-



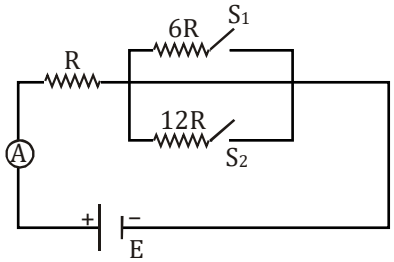
(1) 48 volts (2) 2 volts
(3) 4 volts (4) 1 volts

55. In a network as shown in the figure the potential difference across the resistance 2R is (the cell has an emf E with no internal resistance) :



(1) 2E (2) $\frac{4E}{7}$ (3) $\frac{E}{7}$ (4) E

56. The reading of ammeter is I_1 when only S_1 is closed and I_2 when only S_2 is closed. The reading is I_3 when both S_1 & S_2 are closed simultaneously then :-



(1) $I_1 > I_2 > I_3$ (2) $I_2 > I_3 > I_1$
(3) $I_3 > I_2 > I_1$ (4) $I_3 > I_1 > I_2$

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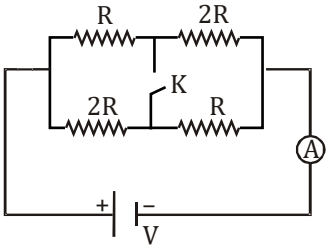
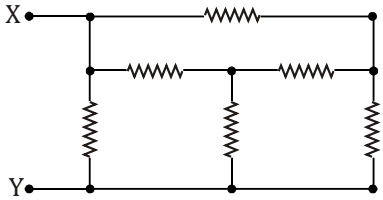
57. How will the reading of ammeter change if the key k is closed?



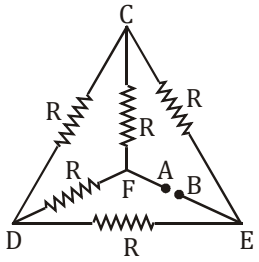
(1) Increase
(2) Decrease
(3) Remains same
(4) Information insufficient

58. Six resistors each of 10 Ω are connected as shown. The equivalent resistance between points X and Y is :



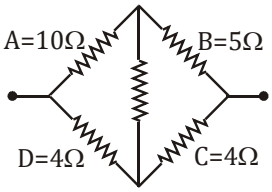
(1) 20 Ω (2) 5 Ω (3) 25/3 Ω (4) 10 Ω

59. Five equal resistances each of resistance R are connected as shown in the Figure. A battery of voltage V is connected between A and B. The current flowing in AFCEB will be



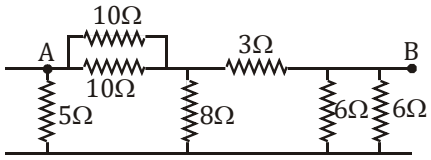
(1) $\frac{V}{R}$ (2) $\frac{V}{2R}$ (3) $\frac{2V}{R}$ (4) $\frac{3V}{R}$

60. In a typical Wheatstone bridge the resistance in cyclic order are A = 10 Ω, B = 5 Ω, C = 4Ω and D = 4 Ω. For the bridge to be balanced :



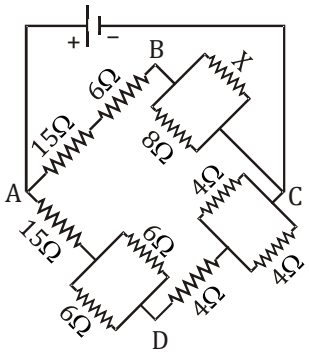
(a) 10 Ω should be connected in parallel with A
(b) 10 Ω should be connected in series with A
(c) 5 Ω should be connected in series with B
(d) 5 Ω should be connected in parallel with B
(1) a, b (2) b, c (3) a, c (4) all

61. Seven resistances are connected as shown in the figure. The equivalent resistance between A and B is :–



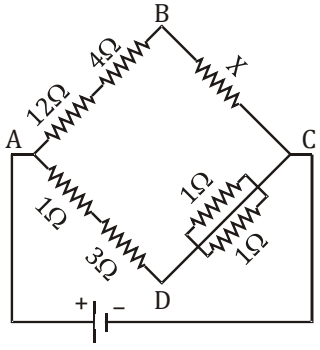
(1) 3 Ω (2) 4 Ω (3) 4.5 Ω (4) 5 Ω

62. In the following circuit diagram the value of resistance X for the potential difference between B and D to be zero is :-



(1) 4 ohms (2) 6 ohms
(3) 8 ohms (4) 9 ohms

63. In the arrangement of resistances shown in the circuit, the potential difference between points B and D will be zero, when the unknown resistance X is :-

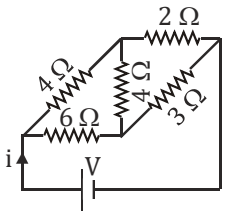


(1) 4 Ω (2) 3 Ω (3) 2 Ω (4) 1 Ω

64. The resistance of each arm of a Wheat stone bridge is 10 Ω. A resistance of 10 Ω is connected in series with the galvanometer then the equivalent resistance across the battery will be :–

(1) 10 Ω (2) 15 Ω (3) 20 Ω (4) 40 Ω

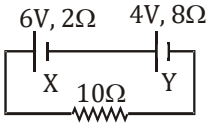
65. For the network shown in the figure the value of the current i is :–



(1) $\frac{18V}{5}$ (2) $\frac{5V}{9}$ (3) $\frac{9V}{35}$ (4) $\frac{5V}{18}$

CELLS & COMBINATION OF CELLS, ELECTRIC POWER & ENERGY

66. Two cells X and Y are connected to a resistance of 10 Ω as shown in the figure. The terminal voltage of cell Y is :-



(1) zero (2) 2 V (3) 4 V (4) 10 V

67. A battery has e.m.f. 4 V and internal resistance 'r'. When this battery is connected to an external resistance of 2 ohms, a current of 1 A flows in the circuit. What current will flow if the terminals of the battery are connected directly?

(1) 1 A (2) 2 A
(3) 4 A (4) infinite

68. Internal resistance of primary cell depends on :-

(1) the nature of electrolyte
(2) the area of plates immersed in the electrolyte
(3) the concentration of electrolyte and distance between the plates
(4) all the above

69. The potential difference between the terminals of a cell is found to be 3 volts when it is connected to a resistance of value equal to its internal resistance. The e.m.f. of the cell is :-

(1) 3 V (2) 6 V (3) 1.5 V (4) 4.5 V

70. A current of 2 A is flowing through a cell of e.m.f. 5 V and internal resistance 0.5 Ω from negative to positive electrode. If the potential of negative electrode is 10 V, the potential of positive electrode will be :-

(1) 5 V (2) 14 V (3) 15 V (4) 16 V

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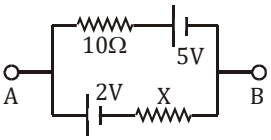
71. In the following circuit if $V_A - V_B = 4$ V, then the value of resistance X in ohms will be :-



(1) 5 (2) 10 (3) 15 (4) 20

72. Electromotive force of a cell is basically a

(1) force (2) power

(3) work (4) current capacity

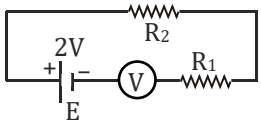
73. The terminal voltage is $\frac{E}{2}$ when a current of 2 A is flowing through 2 Ω resistance; the internal resistance of the cell is :–

(1) 1 Ω (2) 2 Ω (3) 3 Ω (4) 4 Ω

74. When a resistance of 2 ohms is connected across the terminals of a cell, the current is 0.5 A. When the resistance is increased to 5 ohms, the current becomes 0.25 A. The e.m.f. of the cell is:-

(1) 1.0 V (2) 1.5 V (3) 2.0 V (4) 2.5 V

75. A cell of e.m.f. 2 V and negligible internal resistance is connected to resistors R_1 and R_2 as shown in the figure. The resistance of the voltmeter, R_1 and R_2 are 80 Ω, 40 Ω and 80 Ω respectively. The reading of the voltmeter is :



(1) 1.78 V (2) 1.60 V

(3) 0.80 V (4) 1.33 V

76. A cell supplies a current of 0.9 A through a 2 Ω resistor and a current of 0.3 A through a 7 Ω resistor. The internal resistance of the cell is :-

(1) 1.0 Ω (2) 0.5 Ω

(3) 2.0 Ω (4) 1.2 Ω

77. A 10 V battery with internal resistance 0.5 Ω is connected across a variable resistance R. The value of R for which the power delivered to it is maximum, is equal to :-

(1) 0.5 Ω (2) 1 Ω

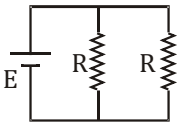
(3) 1.5 Ω (4) 2 Ω

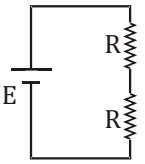
78. An electric bulb is designed to draw a power P_0 at voltage V_0. If the voltage is V, it draws a power P, then –

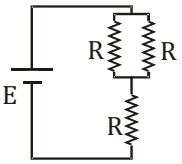
(1) $P = \left(\frac{V}{V_0}\right)P_0$ (2) $P = \left(\frac{V_0}{V}\right)P_0$

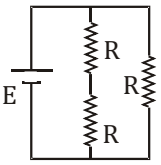
(3) $P = \left(\frac{V_0}{V}\right)^2 P_0$ (4) $P = \left(\frac{V}{V_0}\right)^2 P_0$

79. Consider the four circuits shown in the figure below. In which circuit power dissipated maximum (Neglect the internal resistance of the power supply)

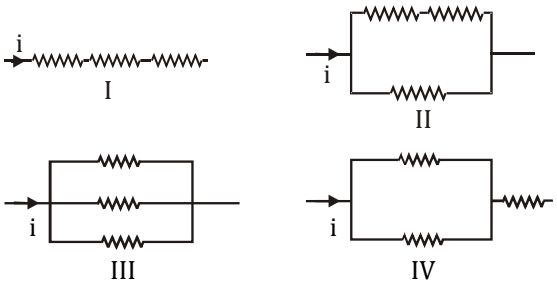
(1) 

(2) 

(3) 

(4) 

80. Three resistances of equal value are arranged in different combinations as shown below. Arrange them in the increasing order of power dissipation:



(1) III < II < IV < I (2) II < III < IV < I

(3) I < IV < III < II (4) I < III < II < IV

81. 25 W, 200 V and 100 W, 200 V bulbs are connected in series to a source of 400 volts. Which bulb will fuse?

(1) 25 W

(2) 100 W

(3) Both will fuse at the same time

(4) None of the bulbs will fuse

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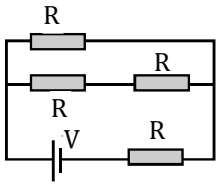
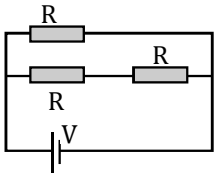
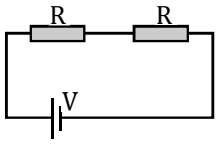
82. You are provided with 48 cells, each of emf 2 volts and internal resistance 4 ohms. What maximum current can flow in the circuit having an external resistance of 12 Ω ?
(1) 1 A (2) 1.2 A
(3) 0.96 A (4) 1.08 A

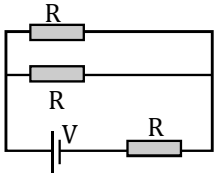
83. two electric bulbs of the same power, but with different marked voltages are connected in series across a power line. Their brightness will be :-
(1) directly proportional to their marked voltages
(2) inversely proportional to their marked voltages
(3) directly proportional to the squares of their marked voltages
(4) inversely proportional to the squares of their marked voltages

84. Four circuits are shown below. All the batteries have the same voltage *V* and all resistors have the same resistance *R*. In which circuit does the battery delivers the most power?

(1) 

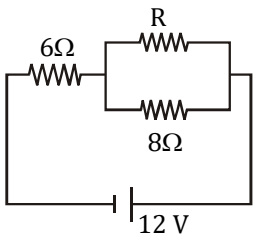
(2) 

(3) 

(4) 

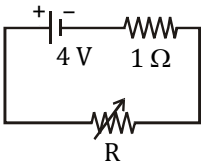
85. Two cells, each of e.m.f. E and internal resistance r, are connected in parallel across a resistor R. The power dissipated in the resistor is maximum if :
(1) R = r (2) R = 2r
(3) $R = \frac{3r}{2}$ (4) $R = \frac{r}{2}$

86. In the circuit shown in figure, the power which is dissipated as heat in the 6 Ω resistor is 6 W. What is the value of resistance R in the circuit?



(1) 6 Ω (2) 10 Ω (3) 13 Ω (4) 24 Ω

87. For different values of resistance, R power consumptions in R are given. Then which of the following values are not possible?



(a) 2 W (b) 5 W (c) 8 W (d) 4 W
(1) Only c (2) b & c (3) a,b,c (4) All

MEASURING DEVICES

88. An ammeter and a voltmeter are joined in series to a cell. Their readings are A and V respectively. If a resistance is now joined in parallel with the voltmeter
(1) both A and V will decrease
(2) both A and V will increase
(3) A will increase, V will decrease
(4) A will decrease, V will increase

89. A galvanometer of 100 Ω resistance yields complete deflection when 10 mA current flows. What should be the value of shunt so that it can measure currents upto 100 mA?
(1) 11.11 Ω (2) 9.9 Ω
(3) 1.1 Ω (4) 4.4 Ω

90. In order to change the range of a galvanometer of G Ω resistance from V volts to nV volts what will be the value of resistance in Ω connected in series with it :–
(1) (n–1)G (2) $\frac{G}{n}$
(3) nG (4) $\frac{G}{n-1}$

91. Resistance in the two gaps of a meter bridge are 10 ohms and 30 ohms respectively. If the resistances are interchanged, the balance point shifts by :–
(1) 33.3 cm (2) 66.67 cm
(3) 25 cm (4) 50 cm

92. A galvanometer acting as a voltmeter will have :
(1) a high resistance in series with its coil
(2) a low resistance in parallel with its coil
(3) a low resistance in series with its coil
(4) a high resistance in parallel with its coil

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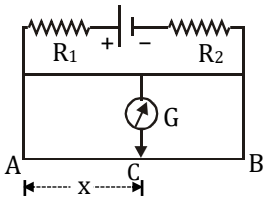
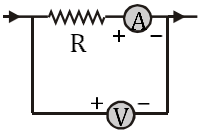
93. In the shown arrangement of the experiment of a meter bridge if AC, corresponding to null deflection of galvanometer, is x then what would be its value if the radius of the wire AB is doubled:-



(1) x (2) $\frac{x}{4}$ (3) 4x (4) 2x

94. In the following circuit, the resistance of the voltmeter is 10,000 Ω and that of the ammeter is 20 Ω. If the reading of the ammeter is 0.1 A and that of the voltmeter is 12 V, then the value of R is :-



(1) 122 Ω (2) 100 Ω
(3) 118 Ω (4) 116 Ω

95. The resistance of a galvanometer is G ohms and the range is 1 volt. The value of resistance (in Ω) used to convert it into a voltmeter of range 10 volts is :-

(1) 9 G (2) G
(3) $\frac{1}{9}$ G (4) 10 G

96. A galvanometer has 36 Ω resistance. If a 4 Ω shunt is added to this, the fraction of current that passes through the galvanometer is :-

(1) $\frac{1}{4}$ (2) $\frac{1}{9}$
(3) $\frac{1}{10}$ (4) $\frac{1}{40}$

97. A galvanometer of resistance 100 Ω gives full deflection for a current of 10^{-5} A. The value of shunt required to convert it into an ammeter of range 1 ampere, is :-

(1) 1 Ω (2) 10^{-3} Ω
(3) 10^{-5} Ω (4) 100 Ω

98. There are three voltmeters of the same range but of resistances 10000 Ω, 8000 Ω and 4000 Ω respectively. The best voltmeter among these is the one whose resistance is :–

(1) 10000 Ω
(2) 8000 Ω
(3) 4000 Ω
(4) all are equally good

99. 20% of the main current passes through the galvanometer. If the resistance of the galvanometer is G, then the resistance of the shunt will be :-

(1) $\frac{G}{50}$ (2) $\frac{G}{4}$
(3) 50G (4) 9G

100. An unknown resistance R_1 is connected in series with a resistance of 10 Ω. This combination is connected to one gap of a metre bridge while a resistance R_2 is connected in the other gap. The balance point is at 50 cm. Now, when the 10 Ω resistance is removed the balance point shifts to 40 cm. The value of R_1 is (in ohms) :-

(1) 20 (2) 10 (3) 60 (4) 40

101. A 1 Ω voltmeter has a range of 1V. Find the additional resistance which has to be joined with the series in voltmeter to increase the range of voltmeter to 100 V :-

(1) 10 Ω (2) $\frac{1}{99}$ Ω
(3) 99 Ω (4) 100 Ω

102. A galvanometer having a resistance G and current i_a flowing in it, produces full scale deflection. If S_1 is the value of shunt which converts it into an ammeter of range 0 – i and S_2 is the value of the shunt for the range 0 – 2i. Then the ratio $\frac{S_1}{S_2}$ will be :-

(1) 1 (2) 2
(3) $\frac{1}{2}\left(\frac{i-i_a}{2i-i_a}\right)$ (4) $\left(\frac{2i-i_a}{i-i_a}\right)$

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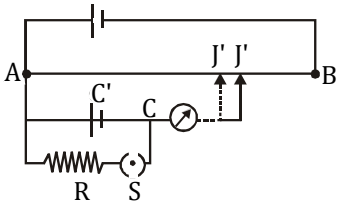
POTENTIOMETER

103. It is observed in a potentiometer experiment that no current passes through the galvanometer, when the terminals of a cell are connected across a certain length of the potentiometer wire. On shunting the cell by a 2 Ω resistance, the balancing length is reduced to half. The internal resistance of the cell is :-
(1) 4 Ω (2) 2 Ω (3) 9 Ω (4) 18 Ω

104. In the potentiometer circuit shown in the figure, the balancing length AJ = 60 cm when switch S is open. When switch S is closed and the value of R = 5 Ω, the balancing length AJ' = 50 cm . The internal resistance of the cell C' is :-



(1) 1.2 Ω (2) 1.0 Ω (3) 0.8 Ω (4) 0.6 Ω

105. In a potentiometer experiment when terminals of the cell are connected at distance of 52 cm on the wire, then no current flows through it. When 5 Ω shunt resistance is connected across the cell the balancing length is 40 cm. The internal resistance of the cell (in Ω) is :-
(1) 5 (2) $\frac{200}{52}$ (3) $\frac{52}{8}$ (4) 1·5

106. A potentiometer wire has a resistance 40 Ω and its length is 10 m. It is connected to a resistance of 760 Ω in series. If emf of battery is 2 V then potential gradient is :–
(1) $0{\cdot}5 \times 10^{-6}$ V/m (2) 1×10^{-6} V/m
(3) 1×10^{-2} V/m (4) 2×10^{-6} V/m

107. A 6 volts battery is connected to the terminals of a three metres long wire of uniform thickness and 100 ohm resistance. The potential difference between two points on the wire separated by a distance of 50 cm will be :–
(1) 3 volts (2) 1 volt
(3) 1.5 volts (4) 2 volts

108. Potentiometer is used for measuring :
(1) potential difference
(2) current
(3) internal resistance
(4) All of these

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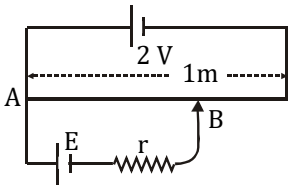
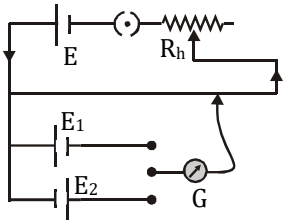
109. Length of a potentiometer wire is kept long and uniform to achive :–
(1) uniform and more potential gradient
(2) non-uniform and more potential gradient
(3) uniform and less potential gradient
(4) non-uniform and less potential gradient

110. In figure battery E is balanced over a 55 cm length of potentiometer wire but when a resistance of 10 Ω is connected in parallel with the battery then it balances over a 50 cm length of the potentiometer wire then internal resistance r of the battery is :-



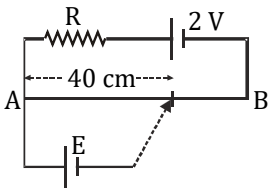
(1) 1 Ω (2) 3 Ω (3) 10 Ω (4) 5 Ω

111. The following diagram shows the circuit for the comparison of e.m.f. of two cells. The circuit can be corrected by :-



(1) reversing the terminals of E
(2) reversing the terminals of E_1
(3) reversing the terminals of E_2
(4) reversing the current in R_h.

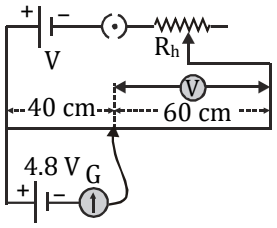
112. AB is a potentiometer wire of length 100 cm and resistance 10 ohms. It is connected in series with a resistance R = 40 ohms and a battery of e.m.f. 2 V and negligible internal resistance. If a source of unknown e.m.f. E is balanced by 40 cm length of the potentiometer wire, the value of E is :-



(1) 0.8 V (2) 1.6 V
(3) 0.08 V (4) 0.16 V

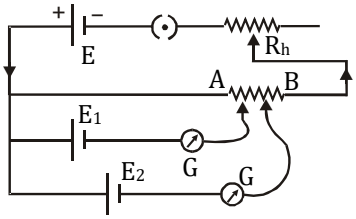
TG: @Chalnaayaaar

113. In the following circuit, the reading of the voltmeter will be :- (in volts)



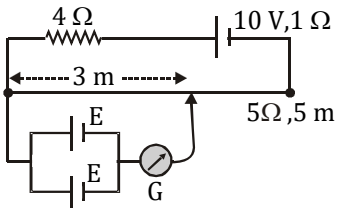
(1) 7.2 (2) 4.8 (3) 6 (4) 4

114. In the following diagram, the deflection in the galvanometer in a potentiometer circuit is zero, then :-



(1) $E_1 > E_2$ (2) $E_2 > E_1$
(3) $E_1 = E_2$ (4) $E_1 + E_2 = E$

115. A resistance of 4 Ω and a wire of length 5 m and resistance 5 Ω are joined in series and connected to a cell of e.m.f. 10 V and internal resistance 1 Ω. A Parallel combination of two identical cells is balanced across 300 cm length of the wire. The e.m.f. E of each cell is :



(1) 1.5 V (2) 3.0 V
(3) 0.67 V (4) 1.33 V

116. The emf of a standard cell is balanced over a 150 cm length of a potentiometer wire. When this cell is shunted by a 2 Ω resistance, the null point is obtained at 100 cm. The value of internal resistance of the cell is :-
(1) 0.1 ohms (2) 1 ohms
(3) 2 ohms (4) 0.5 ohms

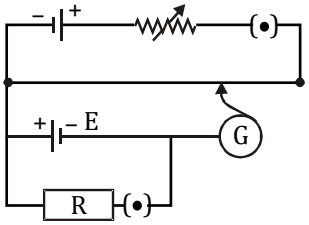
117. The sensitivity of a potentiometer is increased by
(1) increasing the emf of the cell.
(2) increasing the length of the potentiometer wire
(3) decreasing the length of the potentiometer wire
(4) none of the above.

118. A potential gradient is established in the wire by a standard cell for the comparison of emf's of two cells in a potentiometer experiment. Which possibility of the following will lead to the failure of the experiment?
(1) the emf of the standard cell is higher than that of the other cells.
(2) the diameter of the wire is equal along its length
(3) the number of wires is ten.
(4) the emf of the standard cell is less than that of either cells

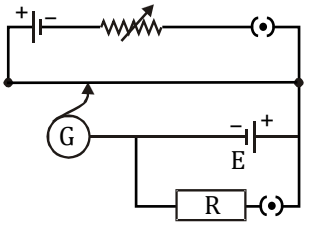
119. Potentiometer wire length is 10 m, having a total resistance of 10 Ω. If a battery of emf 2 volts (of negligible internal resistance) and a rheostat are connected to it then the potential gradient is 20 mV/m; find the resistance imparted through the rheostat :-
(1) 90 Ω (2) 990 Ω
(3) 40 Ω (4) 190 Ω

120. The correct circuit for the determination of internal resistance of a battery by using potentiometer is :

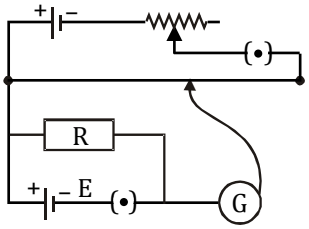
(1)



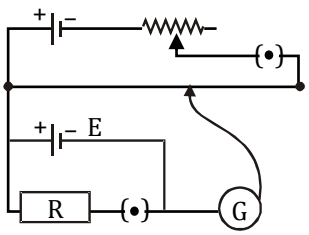
(2)



(3)



(4)



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EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	2	2	3	2	2	3	2	2	3	4	3	3	3	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	1	4	4	3	1	3	4	1	2	4	4	3	1	4	3
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	3	3	3	1	2	4	3	4	3	1	1	4	3	1	1
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	1	4	1	1	4	2	1	3	2	2	4	1	2	2	3
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	2	3	3	1	4	1	2	4	2	2	4	3	2	2	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	2	1	4	1	1	1	1	3	2	4	4	2	3	1	1
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	4	1	1	2	1	3	2	1	2	1	3	4	2	2	4
Question	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	3	2	4	3	1	3	4	1	2	2	2	2	4	1	4

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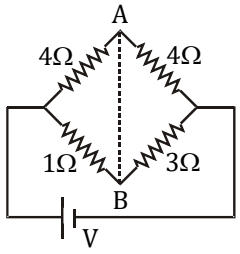
Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. In the circuit shown, if a conducting wire is connected between points A and B, the current in this wire will :-



(1) flow from A to B
(2) flow in the direction which will be decided by the value of V
(3) be zero
(4) flow from B to A

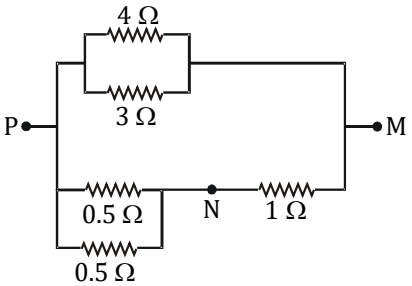
AIPMT 2007

2. The resistance of an ammeter is 13 Ω and its scale is graduated for currents upto 100 A. After an additional shunt is connected to this ammeter it becomes possible to measure currents upto 750 amperes by this meter. The value of shunt-resistance is :–

(1) 2 kΩ (2) 20 Ω
(3) 2 Ω (4) 0.2 Ω

AIPMT 2008

3. In the circuit shown, the current through the 4 Ω resistor is 1 A when the points P and M are connected to a d.c. voltage source. The potential difference between the points M and N is :-

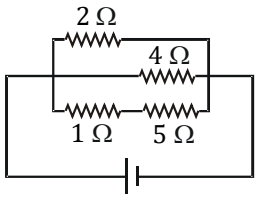


(1) 0.5 volts (2) 3.2 volts
(3) 1.5 volts (4)1.0 volt

4. A galvanometer of resistance 50 Ω is connected to a battery of 3 V along with a resistance of 2950 Ω in series. A full scale deflection of 30 divisions is obtained in the galvanometer. In order to reduce this deflection to 20 divisions, the resistance in series should be :-

(1) 6050 Ω (2) 4450 Ω
(3) 5050 Ω (4) 5550 Ω

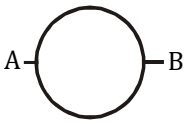
5. A current of 3 amperes flows through the 2 Ω resistor shown in the circuit. The power dissipated in the 5 Ω resistor is :-



(1) 1 watt (2) 5 watts
(3) 4 watts (4) 2 watts

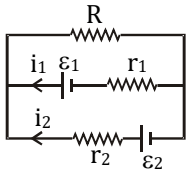
AIPMT 2009

6. A wire of resistance 12 ohms per meter is bent to form a complete circle of radius 10 cm. The resistance between its two diametrically opposite points, A and B as shown in the figure, is :-



(1) 6 Ω (2) 0.6π Ω
(3) 3 Ω (4) 6π Ω

7. See the electrical circuit shown in this figure. Which of the following equations is the correct equation for it?



(1) $\varepsilon_1 - (i_1 + i_2)R + i_1r_1 = 0$
(2) $\varepsilon_1 - (i_1 + i_2)R - i_1r_1 = 0$
(3) $\varepsilon_2 - i_2r_2 - \varepsilon_1 - i_1r_1 = 0$
(4) $-\varepsilon_2 - (i_1 + i_2)R + i_2r_2 = 0$

TG: @Chalnaayaaar

8. A galvanometer having a coil resistance of 60 Ω shows full scale deflection when a current of 1.0 A passes through it. It can be converted into an ammeter to read currents upto 5.0 A by :-

(1) putting in parallel a resistance of 15 Ω

(2) putting in parallel a resistance of 240 Ω

(3) putting in series a resistance of 15 Ω

(4) putting in series a resistance of 240 Ω

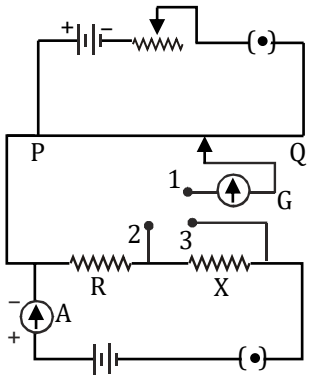
9. A student measures the terminal potential difference (V) of a cell (of emf ε and internal resistance (r) as a function of the current (I) flowing through it. The slope and intercept of the graph between V and I, then respectively, are :-

(1) $-\varepsilon$ and r (2) ε and –r

(3) –r and ε (4) r and $-\varepsilon$

AIPMT (Pre) 2010

10. A potentiometer circuit is set up as shown. The potential gradient, across the potentiometer wire, is k volts/cm and the ammeter, present in the circuit, reads 1.0 A when two way key is switched off. The balance points, when the key between the terminals (i) 1 and 2 (ii) 1 and 3, is plugged in, are found to be at lengths ℓ_1 cm and ℓ_2 cm respectively. The magnitudes, of the resistors R and X, (in ohms), are then, equal to respectively :-



(1) $k\ell_1$ and $k\ell_2$

(2) $k(\ell_2 - \ell_1)$ and $k\ell_2$

(3) $k\ell_1$ and $k(\ell_2 - \ell_1)$

(4) $k(\ell_2 - \ell_1)$ and $k\ell_1$

TG: @Chalnaayaaar

11. A galvanometer has a coil of resistance 100 ohms and gives full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be:-

(1) 1000 Ω (2) 900 Ω

(3) 1800 Ω (4) 500 Ω

12. Consider the following two statements :

(A) Kirchhoff's junction law follows from the conservation of charge.

(B) Kirchhoff's loop law follows from the conservation of energy.

Which of the following is correct?

(1) Both (A) and (B) are correct

(2) Both (A) and (B) are wrong

(3) (A) is correct and (B) is wrong

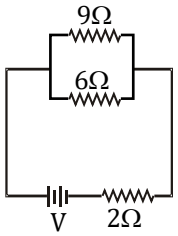
(4) (A) is wrong and (B) is correct.

AIPMT (Pre) 2011

13. A current of 2 A flows through a 2 Ω resistor when connected across a battery. The same battery supplies a current of 0.5 A when connected across a 9 Ω resistor The internal resistance of the battery is :-

(1) 0.5 Ω (2) 1/3 Ω (3) 1/4 Ω (4) 1 Ω

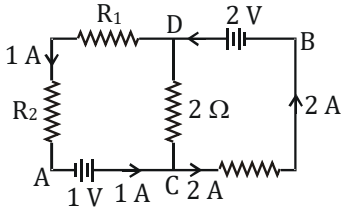
14. If power dissipated in the 9 Ω resistor in the circuit shown is 36 Watt, the potential difference across the 2 Ω resistor is :-



(1) 4 V (2) 8 V (3) 10 V (4) 2 V

AIPMT (Mains) 2011

15. In the circuit shown in the figure, if the potential at point A is taken to be zero, the potential at point B is :-



(1) +1 V (2) –1 V (3) +2V (4) –2 V

TG: @Chalnaayaaar

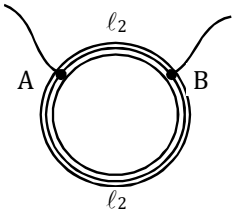
16. A galvanometer of resistance, G, is shunted by a resistance S. To keep the main current in the circuit unchanged, the resistance to be put in series with the galvanometer is :-

(1) $\frac{G}{(S+G)}$ (2) $\frac{S^2}{(S+G)}$

(3) $\frac{SG}{(S+G)}$ (4) $\frac{G^2}{(S+G)}$

AIPMT (Pre) 2012

17. A ring is made of a wire having a resistance $R_0 = 12\ \Omega$. Find the points A and B as shown in the figure at which a current carrying conductor should be connected so that the resistance R of the sub circuit between these points is equal to $\frac{8}{3}\Omega$:-



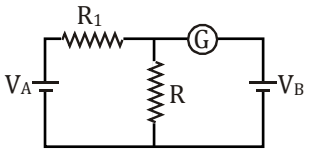
(1) $\frac{\ell_1}{\ell_2}=\frac{3}{8}$ (2) $\frac{\ell_1}{\ell_2}=\frac{1}{2}$

(3) $\frac{\ell_1}{\ell_2}=\frac{5}{8}$ (4) $\frac{\ell_1}{\ell_2}=\frac{1}{3}$

18. If voltage across a bulb rated 220 volts 100 watts drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is :-

(1) 5% (2) 10% (3) 20% (4) 2.5%

19. In the circuit shown the cells A and B have negligible resistances. For $V_A = 12$ V, $R_1 = 500\ \Omega$ and $R = 100\ \Omega$ the galvanometer (G) shows no deflection. The value of V_B is :-



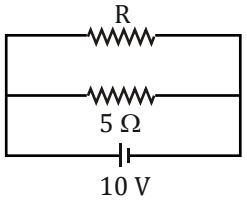
(1) 12 V (2) 6 V (3) 4 V (4) 2 V

20. A millivolt meter of 25 milivolts range is to be converted into an ammeter of 25 amperes range. The value (in ohms) of necessary shunt will be :

(1) 1 (2) 0.05 (3) 0.001 (4) 0.01

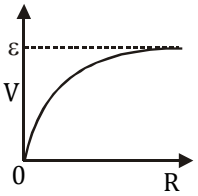
AIPMT (Mains) 2012

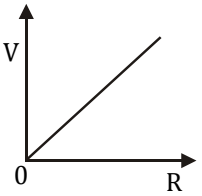
21. The power dissipated in the circuit shown in the figure is 30 watts. The value of R is :-

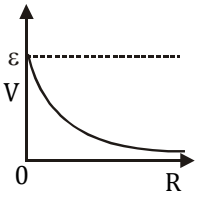


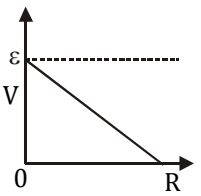
(1) 10 Ω (2) 30 Ω (3) 20 Ω (4) 15 Ω

22. A cell having an emf ε and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by :-

(1)


(2)


(3)


(4)


NEET-UG 2013

23. A wire of resistance 4 Ω is stretched to twice its original length. The resistance of the stretched wire would be :-

(1) 16 Ω (2) 2 Ω

(3) 4 Ω (4) 8 Ω

24. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω is :-

(1) 1.0 Ω (2) 0.2 Ω

(3) 0.5 Ω (4) 0.8 Ω

25. The resistances of the four arms P,Q, R and S in a Wheatstone bridge are 10 ohms, 30 ohms, 30 ohms and 90 ohms, respectively. The e.m.f. and internal resistance of the cell are 7 volts and 5 ohms respectively. If the galvanometer resistance is 50 ohms, the current drawn from the cell will be :-

(1) 2.0 A (2) 1.0 A

(3) 0.2 A (4) 0.1 A

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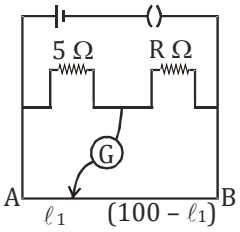
AIPMT 2014

26. Two cities are 150 km apart. Electric power is sent from one city to another city through copper wires. The fall of potential per km is 8 volts and the average resistance per km is 0.5 Ω. the power loss in the wires is :-

(1) 19.2 W (2) 19.2 kW
(3) 19.2 J (4) 12.2 kW

27. The resistance in the two arms of a meter bridge are 5 Ω and R Ω, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at 1.6 ℓ_1. The resistance 'R' is :-



(1) 10 Ω (2) 15 Ω (3) 20 Ω (4) 25 Ω

28. A potentiometer circuit has been set up for finding the internal resistance of a given cell. The main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4m long, when a resistance R, connected across the given cell, has values of,

(i) infinity (ii) 9.5 Ω

The balancing lengths on the potentiometer wire are found to be 3 m and 2.85 m respectively. The value of internal resistance of the cell is :-

(1) 0.25 Ω (2) 0.95 Ω
(3) 0.5 Ω (4) 0.75 Ω

29. In an ammeter 0.2% of main current passes through the galvanometer. If resistance of galvanometer is G, then resistance of ammeter will be :-

(1) $\frac{1}{499}$G (2) $\frac{499}{500}$G
(3) $\frac{1}{500}$G (4) $\frac{500}{499}$G

Re-AIPMT 2015

30. A potentiometer wire of length L and resistance r is connected in series with a battery of e.m.f. E_0 and a resistance r_1. An unknown e.m.f. E is balanced at a length ℓ of the potentiometer wire. The e.m.f. E will be given by :

(1) $\frac{LE_0 r}{(r+r_1)\ell}$ (2) $\frac{LE_0 r}{\ell r_1}$
(3) $\frac{E_0 r}{(r+r_1)}\cdot\frac{\ell}{L}$ (4) $\frac{E_0\ell}{L}$

31. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metal wires respectively, the effective conductivity of the combination is :-

(1) $\frac{\sigma_1\sigma_2}{\sigma_1+\sigma_2}$ (2) $\frac{2\sigma_1\sigma_2}{\sigma_1+\sigma_2}$
(3) $\frac{\sigma_1+\sigma_2}{2\sigma_1\sigma_2}$ (4) $\frac{\sigma_1+\sigma_2}{\sigma_1\sigma_2}$

32. A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be :-

(1) 1 A (2) 0.5 A
(3) 0.25 A (4) 2 A

AIPMT - 2015

33. Across a metallic conductor of non-uniform cross section a constant potential difference is applied. The quantity which remains constant along the conductor is :

(1) current
(2) drift velocity
(3) electric field
(4) current density

34. A potentiometer wire has length 4 m and resistance 8Ω. The resistance that must be connected in series with the wire and an accumulator of e.m.f. 2V, so as to get a potential gradient 1 mV per cm on the wire is :

(1) 40 Ω (2) 44 Ω
(3) 48 Ω (4) 32 Ω

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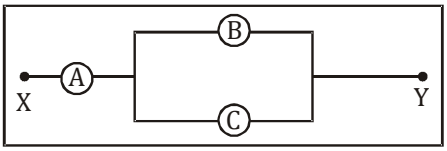
35. A, B and C are voltmeters of resistance R, 1.5 R and 3R respectively as shown in the figure. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C respectively. Then :



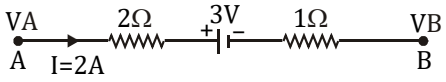
(1) $V_A \neq V_B = V_C$ (2) $V_A = V_B \neq V_C$
(3) $V_A \neq V_B \neq V_C$ (4) $V_A = V_B = V_C$

NEET-I 2016

36. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in the two cases. The ratio of emf's is :-
(1) 5 : 1 (2) 5 : 4 (3) 3 : 4 (4) 3 : 2

NEET-II 2016

37. The potential difference ($V_A - V_B$) between the points A and B in the given figure is :-



(1) + 6 V (2) + 9 V (3) – 3 V (4) + 3 V

38. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is :-
(1) 26 Ω (2) 13 Ω (3) 230 Ω (4) 46 Ω

NEET(UG)-2017

39. The resistance of a wire is 'R' ohm. If it is melted and stretched to 'n' times its original length, its new resistance will be :-
(1) $\frac{R}{n}$ (2) n^2R (3) $\frac{R}{n^2}$ (4) nR

40. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F. because the method involves :-
(1) Potential gradients
(2) A condition of no current flow through the galvanometer
(3) A combination of cells, galvanometer and resistances
(4) Cells

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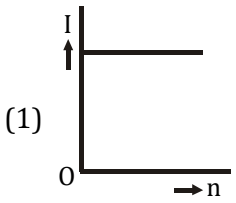
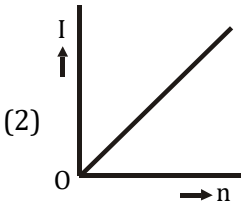
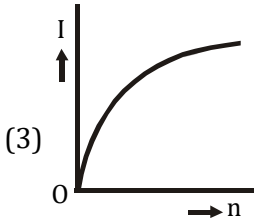
NEET(UG)-2018

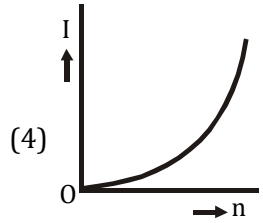
41. A set of 'n' equal resistors, of value 'R' each, are connected in series to a battery of emf 'E' and internal resistance 'R'. The current drawn is I. Now, the 'n' resistors are connected in parallel to the same battery. Then the current drawn from battery becomes 10 I. The value of 'n' is :-
(1) 10 (2) 11 (3) 20 (4) 9

42. A battery consists of a variable number 'n' of identical cells (having internal resistance 'r' each) which are connected in series. The terminals of the battery are short-circuited and the current I is measured. Which of the graphs shows the correct relationship between I and n?

(1) 

(2) 

(3) 

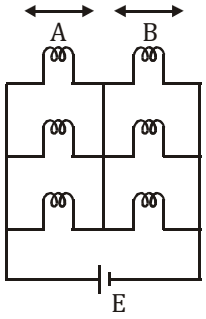
(4) 

43. A carbon resistor (47 ± 4.7) kΩ is to be marked with rings of different colours for its identification. The colour code sequence will be :-
(1) Violet – Yellow – Orange – Silver
(2) Yellow – Violet – Orange – Silver
(3) Yellow – Green – Violet – Gold
(4) Green – Orange – Violet – Gold

44. Current sensitivity of a moving coil galvanometer is 5 div/mA and its voltage sensitivity (angular deflection per unit voltage applied) is 20 div/V. The resistance of the galvanometer is
(1) 40 Ω (2) 25 Ω
(3) 250 Ω (4) 500 Ω

NEET(UG)-2019

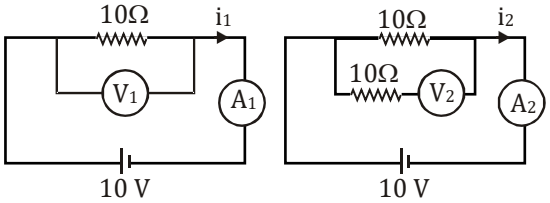
45. Six similar bulbs are connected as shown in the figure with a DC source of emf E, and zero internal resistance.
The ratio of power consumption by the bulbs when (i) all are glowing and (ii) in the situation when two from section A and one from section B are glowing, will be :



(1) 4 : 9 (2) 9 : 4 (3) 1 : 2 (4) 2 : 1

46. Which of the following acts as a circuit protection device?
(1) conductor (2) inductor
(3) switch (4) fuse

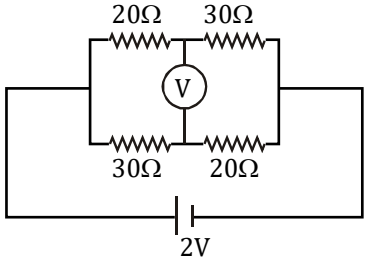
47. In the circuits shown below, the readings of the voltmeters and the ammeters will be :



(1) $V_2 > V_1$ and $i_1 = i_2$
(2) $V_1 = V_2$ and $i_1 > i_2$
(3) $V_1 = V_2$ and $i_1 = i_2$
(4) $V_2 > V_1$ and $i_1 > i_2$

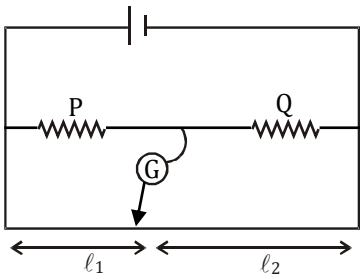
NEET(UG)-2019 (Odisha)

48. The reading of an ideal voltmeter in the circuit shown is :



(1) 0.6 V (2) 0 V (3) 0.5 V (4) 0.4 V

49. The metre bridge shown is in balanced position with $\frac{P}{Q}=\frac{\ell_1}{\ell_2}$. If we now interchange the positions of galvanometer and cell, will the bridge work ? If yes, what will be balance condition ?



(1) yes, $\frac{P}{Q}=\frac{\ell_2-\ell_1}{\ell_2+\ell_1}$ (2) no, no null point

(3) yes, $\frac{P}{Q}=\frac{\ell_2}{\ell_1}$ (4) yes, $\frac{P}{Q}=\frac{\ell_1}{\ell_2}$

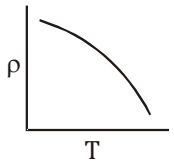
NEET(UG)-2020

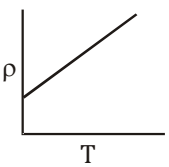
50. The color code of a resistance is given below

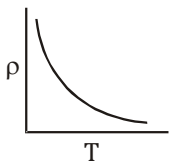
The values of resistance and tolerance, respectively, are :
(1) 470 Ω, 5% (2) 470 kΩ, 5%
(3) 47 kΩ, 10% (4) 4.7 kΩ, 5%

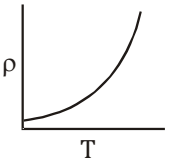
51. A charged particle having drift velocity of 7.5×10^{-4} ms^{-1} is an electric field of 3×10^{-10} Vm^{-1}, has a mobility in $m^2 V^{-1} s^{-1}$ of :
(1) 2.25×10^{-15} (2) 2.25×10^{15}
(3) 2.5×10^{6} (4) 2.5×10^{-6}

52. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

(1) 

(2) 

(3) 

(4) 

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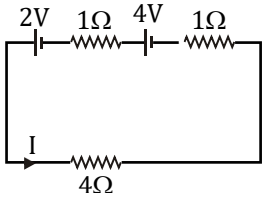
53. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.5×10^{-2} m (2) 1.0×10^{-2} m
(3) 1.0×10^{-1} m (4) 1.5×10^{-1} m

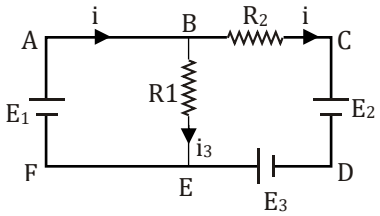
NEET(UG)-2020 (Covid-19)

54. For the circuit shown in the figure, the current I will be



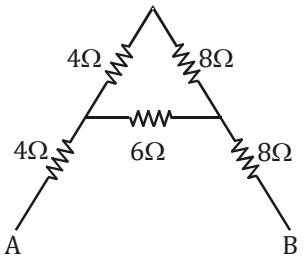
(1) 0.75 A (2) 1 A
(3) 1.5 A (4) 0.5 A

55. For the circuit given below, the Kirchoff's loop rule for the loop BCDEB is given by the equation



(1) $-i_2R_2 + E_2 - E_3 + i_3R_1 = 0$
(2) $i_2R_2 + E_2 - E_3 - i_3R_1 = 0$
(3) $i_2R_2 + E_2 + E_3 + i_3R_1 = 0$
(4) $-i_2R_2 + E_2 + E_3 + i_3R_1 = 0$

56. The equivalent resistance between A and B for the mesh shown in the figure is



(1) 7.2 Ω (2) 16 Ω
(3) 30 Ω (4) 4.8 Ω

57. Two solid conductors are made up of same material, have same length and same resistance. One of them has a circular cross section of area A_1 and the other one has a square cross section of area A_2. The ratio A_1/A_2 is

(1) 1.5 (2) 1
(3) 0.8 (4) 2

NEET(UG)-2021

58. **Column-I** gives certain physical terms associated with flow of current through a metallic conductor. **Column-II** gives some mathematical relations involving electrical quantities. Match **Column-I** and **Column-II** with appropriate relations.

Column-I		Column-II	
(A)	Drift Velocity	(P)	$\frac{m}{ne^2\rho}$
(B)	Electrical Resistivity	(Q)	nev_d
(C)	Relaxation Period	(R)	$\frac{eE}{m}\tau$
(D)	Current Density	(S)	$\frac{E}{J}$

(1) (A)-(R), (B)-(S), (C)-(P), (D)-(Q)
(2) (A)-(R), (B)-(S), (C)-(Q), (D)-(P)
(3) (A)-(R), (B)-(P), (C)-(S), (D)-(Q)
(4) (A)-(R), (B)-(Q), (C)-(S), (D)-(P)

59. The effective resistance of a parallel connection that consists of four wires of equal length, equal area of cross-section and same material is 0.25 Ω. What will be the effective resistance if they are connected in series?

(1) 0.25 Ω (2) 0.5 Ω
(3) 1 Ω (4) 4Ω

60. In a potentiometer circuit a cell of EMF 1.5 V gives balance point at 36 cm length of wire. If another cell of EMF 2.5 V replaces the first cell, then at what length of the wire, the balance point occurs?

(1) 60 cm (2) 21.6 cm
(3) 64 cm (4) 62 cm

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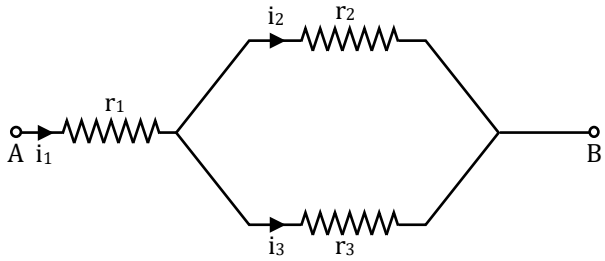
61. Three resistors having resistances r_1, r_2 and r_3 are connected as shown in the given circuit. The ratio $\frac{i_3}{i_1}$ of currents in terms of resistances used in the circuit is :



(1) $\frac{r_1}{r_2+r_3}$ (2) $\frac{r_2}{r_2+r_3}$

(3) $\frac{r_1}{r_1+r_2}$ (4) $\frac{r_2}{r_1+r_3}$

NEET(UG)-2022

62. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 >> R_2$) have equal charges. The potential would be :

(1) more on smaller sphere
(2) equal on both the spheres
(3) dependent on the material property of the sphere
(4) more on bigger sphere

63. Two resistors of resistance, 100 Ω and 200 Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100 Ω to that in 200 Ω in a given time is :

(1) 2 : 1 (2) 1 : 4
(3) 4 : 1 (4) 1 : 2

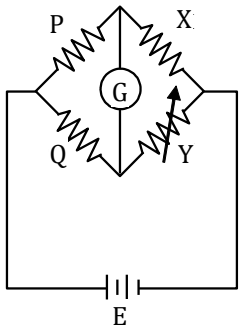
64. As the temperature increase, the electrical resistance :

(1) decreases for both conductors and semiconductors
(2) increases for conductors but decreases for semiconductors
(3) decreases for conductors but increase for semiconductors
(4) increases for both conductors and semiconductors.

65. A copper wire of length 10 m and radius $\left(10^{-2}/\pi\right)$m has electrical resistance of 10 Ω. The current density in the wire for an electric field strength of 10 (V/m) is:

(1) 10^6 A/m^2 (2) 10^{-5} A/m^2
(3) 10^5 A/m^2 (4) 10^4 A/m^2

66. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistances P and Q :



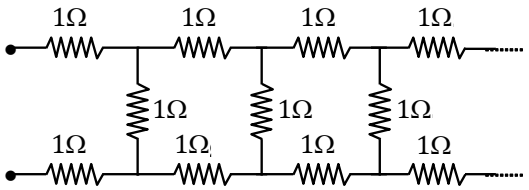
(1) should be approximately equal and are small
(2) should be very large and unequal
(3) do not play any significant role
(4) should be approximately equal to 2X

RE-NEET(UG)-2022

67. A cell of emf 4 V and internal resistance 0.5 Ω is connected to a 7.5 Ω external resistance. The terminal potential difference of the cell is :-

(1) 3.75 V (2) 4.25 V
(3) 4 V (4) 0.375 V

68. The equivalent resistance of the infinite network given below is :



(1) 2 Ω (2) $(1+\sqrt{2})$ Ω
(3) $(1+\sqrt{3})\Omega$ (4) $(1+\sqrt{5})\Omega$

69. The reciprocal of resistance is :

(1) reactance (2) mobility
(3) conductivity (4) conductance

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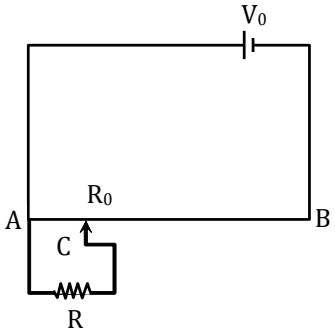
70. The sliding contact C is at one fourth of the length of the potentiometer wire (AB) from A as shown in the circuit diagram. If the resistance of the wire AB is R_0, then the potential drop (V) across the resistor R is:



(1) $\frac{4V_0R}{3R_0+16R}$ (2) $\frac{4V_0R}{3R_0+R}$

(3) $\frac{2V_0R}{4R_0+R}$ (4) $\frac{2V_0R}{2R_0+3R}$

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	4	3	2	2	2	2	2	1	3	3	2	1	2	3	1
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	2	1	4	3	1	1	1	3	3	2	2	3	3	3
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	2	2	1	4	4	4	2	1	2	2	1	1	2	3	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	4	3	4	4	1	3	4	3	2	2	2	2	1	4	1
Question	61	62	63	64	65	66	67	68	69	70					
Answer	2	1	1	2	3	1	1	3	4	1					

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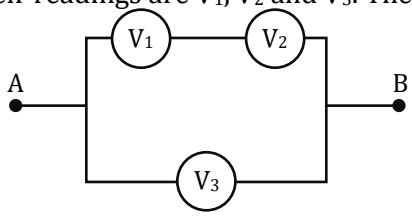
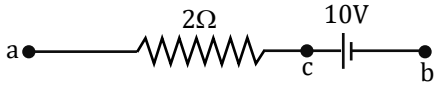
Exercise - III (Analytical Questions) Master Your Understanding

1. Three voltmeters all having different resistance, are joined as shown. When some potential difference is applied across A and B, their readings are V_1, V_2 and V_3. Then



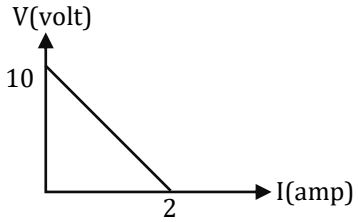
(a) $V_1 = V_2$ (b) $V_1 \neq V_2$
(c) $V_1 + V_2 = V_3$ (d) $V_1 + V_2 > V_3$
(1) only a is correct
(b) only b is correct
(3) only c is correct
(4) only b & c are correct

2. In the circuit shown in figure it is given that $V_b - V_a = 2$ volt. Choose the correct options.



(a) Current in the wire is 6 A
(b) Direction of current is from a to b
(c) $V_a - V_c = -12$ volt
(d) $V_c - V_a = -12$ volt
(1) only a & b (b) only b & c
(3) only a & c (4) all

3. A battery of e.m.f E and internal resistance r is connected to a resistance R which can be adjusted to any value greater than or equal to zero. A graph is plotted between the current passing through the resistance (I) and potential difference (V) across it. Select the correct alternatives

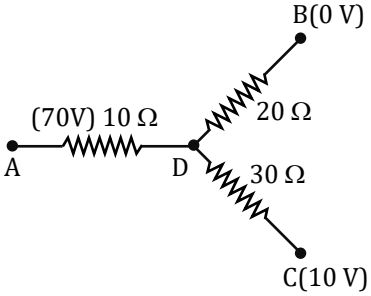


(a) Internal resistance of the battery is 5Ω
(b) emf of the battery is 10 V
(c) maximum current which can be taken from the battery is 2A
(d) V-I graph can never be a straight lines as shown in the figure
(1) only a & b (2) a, b & c
(3) only b & c (4) all

4. Which of the following statements is/are correct for potentiometer circuit?
(a) Sensitivity varies proportionally with the length of the potentiometer wire
(b) Sensitivity is inversely proportional to the potential difference applied across the potentiometer wire
(c) Accuracy of a potentiometer can be increased only by increasing the length of wire
(d) Range depends upon the potential difference applied across the potentiometer wire
(1) only a & c (2) a, b & d
(3) a, b & c (4) only b & c

5. Two heaters designed for the same voltage V have different power ratings. When connected individually across a source of voltage V, they produce H amount of heat each in times t_1 and t_2 respectively. When used together across the same source, they produce H amount of heat in time t. Then correct option is
(a) If they are in series, $t = t_1 + t_2$
(b) If they are in series, $t = 2(t_1 + t_2)$
(c) If they are in parallel, $t = \frac{t_1 t_2}{(t_1 + t_2)}$
(d) If they are in parallel, $t = \frac{t_1 t_2}{2(t_1 + t_2)}$
(1) only a & c (2) only a & b
(3) only c & d (4) all

6. In the network shown in figure, points A, B and C are at potentials of 70 V, 0 and 10 V respectively.



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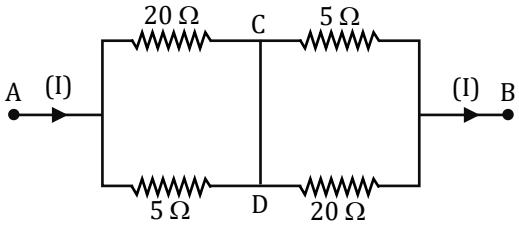
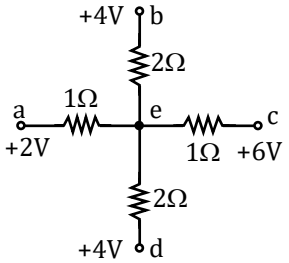
(a) Point D is at a potential of 40V.
(b) The currents in the sections AD, DB, DC are in the ratio 3:2:1
(c) The currents in the sections AD, DB, DC are in the ratio 1:2:3.
(d) The network draws a total power of 200 W.
(1) only a is correct
(2) a and c are correct
(3) a, b, d are correct
(4) None of these

7. When some potential difference is maintained between A and B, current I enters the network at A and leaves at B see figure.



(a) The equivalent resistance between A and B is 8Ω
(b) C and D are at the same potential.
(c) No current flows between C and D
(d) Current 3I/5 flows from D to C.
(1) a, b, d are correct
(2) a, d are correct
(3) a, c, d are correct
(4) all are correct

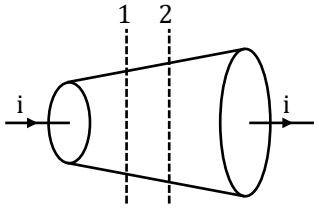
8. For the circuit shown in figure, match the two columns.



	Column-I		Column-II
(a)	Current in wire ae	(p)	1 A
(b)	Current in wire be	(q)	2 A
(c)	Current in wire ce	(r)	0.5 A
(d)	Current in wire de	(s)	Zero

(1) a-q, b-s, c-q, d-s
(2) a-q, b-q, c-s, d-p
(3) a-p, b-r, c-s, d-q
(4) a-q, b-r, c-p, d-s

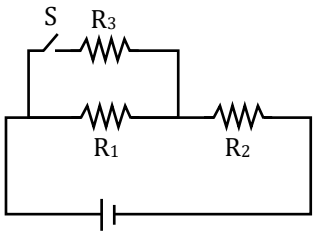
9. Current i is flowing through a wire of non-uniform cross section as shown. Match the following two columns.



	Column-I		Column-II
(a)	Current density	(p)	is more at 1
(b)	Electric field	(q)	is more at 2
(c)	Resistance per unit length	(r)	is same at both sections 1 and 2
(d)	Potential difference per unit length	(s)	data insufficient

(1) a-p, b-p, c-p, d-p (2) a-q, b-r, c-s, d-p
(3) a-q, b-q, c-p, d-p (4) a-p, b-q, c-r, d-s

10. In the circuit shown in figure, after closing the switch S, match the following two columns.



	Column-I		Column-II
(a)	Current through R_1	(p)	will increase
(b)	Current through R_2	(q)	will decrease
(c)	Potential difference across R_1	(r)	will remain same
(d)	Potential difference across R_2	(s)	data insufficient

(1) a-p, b-q, c-r, d-s
(2) a-p, b-r, c-s, d-q
(3) a-p, b-r, c-s, d-p
(4) a-q, b-p, c-q, d-p

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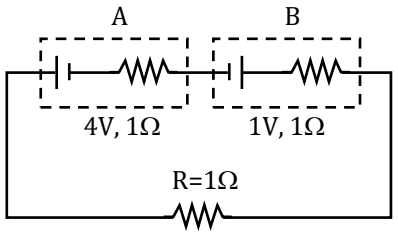
11. Match the following two columns.

	Column-I		Column-II
(a)	Electrical resistance	(p)	$[ML^3T^{-3}A^{-2}]$
(b)	Electrical potential	(q)	$[ML^2T^{-3}A^{-2}]$
(c)	Specific resistance	(r)	$[ML^2T^{-3}A^{-1}]$
(d)	Specific conductance	(s)	None of these

(1) a-q, b-s, c-r, d-p (2) a-q, b-r, c-p, d-s
(3) a-p, b-q, c-s, d-r (4) a-p, b-r, c-q, d-s

12. In the circuit shown in the figure, match the following two columns:



	Column-I		Column-II (In SI units)
(a)	Potential difference across battery A	(p)	Zero
(b)	Potential difference across battery B	(q)	1
(c)	Net power consumed by R	(r)	2
(d)	Potential difference across R	(s)	3

(1) a-p, b-q, c-r, d-s (2) a-s, b-q, c-r, d-p
(3) a-s, b-r, c-q, d-q (4) a-q, b-r, c-s, d-s

13. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Drift velocity of electron in a metallic wire will decrease if temperature of wire is increased
Reason (R) : On increasing temperature conductivity of metallic wire decreases.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

14. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Resistance of ammeter is less than resistance of milliammeter, (If made from same galvanometer)
Reason (R) : Value of shunt resistance in case of ammeter is more than a milliammeter.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

15. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Electric field is present inside the current carrying wire.
Reason (R) : The principle of conservation of charge is followed, when charges are in motion.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

16. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : In balanced Wheatstone bridge, the current through cell depends on resistance of galvanometer.
Reason (R) : At balanced condition current through galvanometer is zero.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

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17. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : In series combination of electrical bulb, lower power rating bulb emits more light than that of higher power rating bulb.
Reason (R) : The lower power rating bulb in series gets more current than the higher power rating bulb.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

18. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : When an external resistor of resistance R (connected across a cell of internal resistance r) is varied, power consumed by resistance R is maximum when R = r.
Reason (R) : Power consumed by a resistor of constant resistance R is maximum when current through it is maximum.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

19. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Ohm's law holds only for small currents in metallic wire not for high currents.
Reason (R) : For metallic wire resistance increases with increase in temperature.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

20. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : In a Meter Bridge experiment, null point for an unknown resistance is measured. Now, the unknown resistance is put inside an enclosure maintained at a higher temperature. The null point can be obtained at the same point as before by decreasing the value of the standard resistance.
Reason (R) : Resistance of a metal increases with increase in temperature.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

21. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : Kirchoff's loop law represents conservation of energy
Reason (R) : If the sum of "Potential Differences" around a closed loop is zero, unlimited energy could be gained by repeatedly carrying a charge around a loop
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

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22. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : In potentiometer experiment, null point can not be obtained if emf of unknown cell is more than emf of source battery.

Reason (R) : By increasing the emf of source battery balancing length increases.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) **(A)** is false but **(R)** is true.

23. If the current in resistance of uniform cross section is doubled then, (assume temperature to be approximately constant).

(A) the current density is doubled

(B) the conduction electron density is doubled

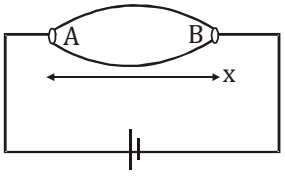
(C) the mean time between collision is constant

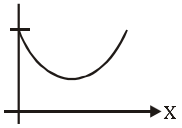
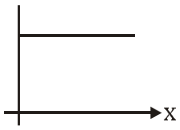
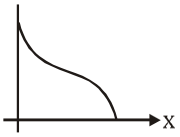
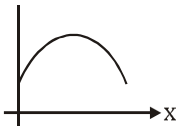
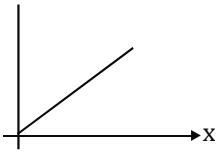
(D) the electron drift speed is doubled

(1) A, C, D (2) B, C, D

(3) A, B, C (4) A, B, C, D

24. A resistor of varying cross–section is attached with a battery as shown. Variation of area from both ends are similar and areas are same at ends and maximum at centre. Match the approximate graphical representation of various physical properties in columns, where x axis represents position from end A of resistor and y–axis various physical properties.



Column I	Column II
(A) i (current)	(P) 
(B) j (current density)	(Q) 
(C) E (electric field)	(R) 
(D) V_d (potential)	(S) 
	(T) 

Options :-

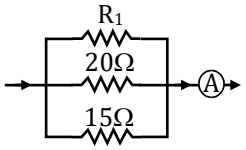
(1) A → S, B → P, C → P, D → R

(2) A → Q, B → P, C → P, D → R

(3) A → T, B → Q, C → P, D → S

(4) A → Q, B → P, C → P, D → T

25. In the given circuit the current flowing through the resistance 20 ohms is 0.3 ampere while the ammetre reads 0.9 ampere. What is the value of R_1(in ohms).



(1) 20Ω

(2) 15Ω

(3) 30Ω

(4) 60Ω

26. **Statement 1**: Voltage across a battery is always less than its emf.

and

Statement 2 : There is always some loss of energy due to internal resistance of the battery.

(1) Statement–1 is True, Statement–2 is True; Statement–2 is a correct explanation for Statement–1.

(2) Statement–1 is True, Statement–2 is True; Statement–2 is not a correct explanation for Statement–1.

(3) Statement–1 is True, Statement–2 is False.

(4) Statement–1 is False, Statement–2 is True.

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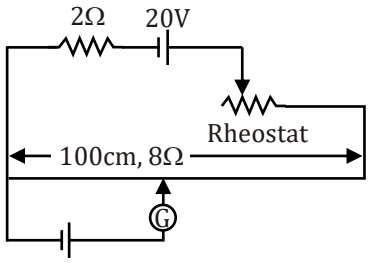
27. A student was given the experiment to measure the emf of a unknown cell using potentiometer. He cheated result and wrote the observation arbitrarily and was caught. Which reading helped the teacher to arrive at the conclusion that he cheated?



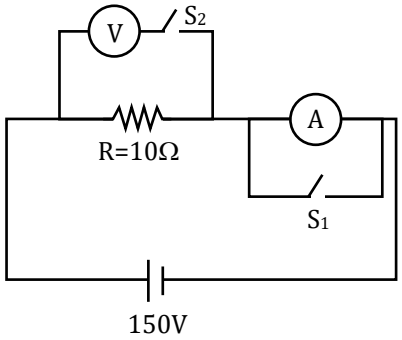
10V (value cheated)

S.N.	value of rheostat	Null point
I.	R_1	50 cm
II.	R_2	60 cm
III.	R_3	70 cm
IV.	R_4	80 cm

(1) Only I (2) I, II
(3) II, IV (4) Only IV

28. **Statement–1 :** A potentiometer having 10 wires is more accurate than the potentiometer having 1 wire.
Statement–2 : Potential gradient of 10–wire potentiometer is much less.
(1) Statement–1 is True, Statement–2 is True; Statement–2 is a correct explanation for Statement–1.
(2) Statement–1 is True, Statement–2 is True; Statement–2 is not a correct explanation for Statement–1.
(3) Statement–1 is True, Statement–2 is False.
(4) Statement–1 is False, Statement–2 is True.

29. Voltmeter of resistance 10Ω and ammeter of resistance 10Ω are attached in the following circuit with switches S_1 and S_2



Column I (switch position)	Column II (reading of voltmeter & ammeter)
(A) S_1 open, S_2 closed	(P) 0, 7.5 A
(B) S_1 closed, S_2 open	(Q) 50 V, 10A
(C) S_1 open, S_2 open	(R) 0, 0
(D) S_1 closed, S_2 closed	(S) 150 V, 0

Options :-
(1) A → S, B → R, C → P, D → Q
(2) A → Q, B → R, C → P, D → S
(3) A → Q, B → P, C → R, D → S
(4) A → S, B → P, C → R, D → Q

30.

	Column-I (Situration)		Column-II (Values in MKS units)
(A)	Magnitude of electric field at (1,1,1) if potential is given by $V=-\frac{1}{x}-\frac{1}{y}-\frac{1}{z}$, is	(P)	0.4
(B)	The charge flowing through a resistance 6Ω varies with t as $Q = 4t - 2t^2$. The total heat produced in resistance till the current reach to zero.	(Q)	$\sqrt{3}$
(C)	A milliammeter of range 10mA has a coil of resistance 0.99 Ω. To use it as an ammeter of range 1A, the required shunt must have a resistance of	(R)	0.01
(D)	Two unlike point charges of same magnitude 10 mC are placed on x-axis at a separation of 8 cm. If both charges placed symmetrically about origin in external electric field $\vec{E}=500\text{Vm}^{-1}\,\hat{i}$. Then potential energy of the system may be [Assume potential energy to be zero when dipole is perpendicular to electric field]	(S)	32

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Options :-

(1) A → Q, B → S, C → P, D → R

(2) A → S, B → Q, C → R, D → P

(3) A → Q, B → S, C → R, D → P

(4) A → S, B → Q, C → P, D → R

31. **Statement-1** : In real battery total chemical energy lost in the battery can not be obtained at load resistance.

Statement-2 : Two heaters with different resistance are connected in parallel. Higher resistance heater will glow more.

(1) Statement–1 is True, Statement–2 is True; Statement–2 is a correct explanation for Statement–1.

(2) Statement–1 is True, Statement–2 is True; Statement–2 is not a correct explanation for Statement–1.

(3) Statement–1 is True, Statement–2 is False.

(4) Statement–1 is False, Statement–2 is True.

32. **Match the column I with column II -**

	Column-I (Instruments)		**Column-II (Based on)**
(A)	Hot wire ammeter	(P)	Heating effect of current
(B)	Moving coil galvanometer	(Q)	Magnetic effect of current
(C)	Potentiometer	(R)	Chemical effect of current
(D)	Voltameter	(S)	Peltier effect of current
		(T)	Zero deflection method

Options :-

(1) A → P, B → T, C → Q, D → R

(2) A → P, B → T, C → Q, D → S

(3) A → P, B → Q, C → T, D → R

(4) A → Q, B → P, C → T, D → R

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	4	3	2	2	1	3	1	1	1	4	2	3	2	3	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	3	2	1	4	3	3	1	2	3	4	2	1	2	3
Question	31	32													
Answer	3	3													

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Important Notes

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Important Notes